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ABSTRACT

The manual was designed to help vocational education curriculum experts learn procedures for constructing task inventories and for analyzing occupational performance. The manual opens with definitions of a task inventory and other terms, and an overview of the procedure. The first six steps involve the overall construction of an initial task inventory (define scope of performance situation; locate written sources of activity statements; draft task and duty statements; obtain knowledgeable consultants to review, edit and group items; and pilot test items). The second six steps cover the acquisition of information about each task (determine task information needed; determine appropriate job incumbent sources; prepare and pilot test questions; develop sampling plan and analysis design; print questionnaire; and administer questionnaires). The final five steps describe the analysis of the task data derived from the previous steps (develop inventory record procedures; key punch task inventory data; compute general summary statistics; record additional tasks written in by respondents; and prepare report of analysis results). Each of these three sections concludes with selftest items, designed to help the readers evaluate their learning of the concepts introduced. Duty statements, background information questions, the inventory and instructions, and sample letters are appended. (JB)

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Procedures for Constructing and Using Task Inventories

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Research and Development Series No. 91

PROCEDURES FOR CONSTRUCTING AND USING TASK INVENTORIES

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FOREWORD

This manual is designed to help vocational education curriculum experts learn procedures for constructing task inventories and for analyzing occupational performance. The manual parallels, in substantive content, the work of Sidney D. Borcher, formerly of The Center's Instructional Systems Design Program, and now director, Arizona Research Coordinating Unit. That work sought to provide methods, procedures, and forms for acquiring useful information concerning occupational performance using U.S. Air Force job inventory concepts.

The primary goals of this manual are to elaborate and clarify the procedures for constructing task inventories and for analyzing occupational performance. The reader is guided through an explicit set of steps and procedures and is provided the means by which he can periodically assess his understanding of important concepts and terms introduced in the manual.

The manual introduces and discusses various problems likely to be encountered when constructing a task inventory. The adoption of one solution over another is encouraged in instances where there is adequate evidence to recommend it. In other instances, an approach or solution may be arbitrary. In short, the manual does not profess to have the best solutions to all problems.

Many people have contributed to the work leading to the development of this manual. In particular, The Center is indebted to the authors, William H. Melching and Sidney D. Borcher. Special recognition is also extended to Wayne Archer and to Raymond Christal, Personnel Research Laboratory, Lackland Air Force Base, Texas, for their assistance and consultation in adapting the procedures for task inventory analysis developed at the Personnel Research Laboratory. This manual has profited greatly and drawn heavily from the work of Joseph Morsh and Wayne Archer and the document, *Procedural Guide for Conducting Occupational Surveys in the United States Air Force*, Lackland Air Force Base, Texas, Personnel Research Laboratory, 1967.

Robert E. Taylor
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and Technical Education

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PROCEDURES FOR CONSTRUCTING AND USING TASK INVENTORIES

CHAPTER I
INTRODUCTION AND OVERVIEW

The Center for Vocational and Technical Education is developing a system for acquiring and using occupational information effectively in revising and designing curricula. The present manual provides methods, procedures, and forms to be used by a curriculum designer in acquiring useful information concerning occupational performance. The approach is an application of U.S. Air Force task inventory concepts.[1]

To facilitate acquisition of the skills needed to develop and use task inventories, the procedures one should follow have been expressed in a series of explicit steps. This format is an effective means by which to communicate to the reader the activities he must learn to perform. As might be expected, procedures to follow in performing some steps are described in more detail than in others. This is due mainly to differences in the amount of guidance one finds in the literature. Some steps have been the source of many problems and have had much written about them. By contrast, other steps are rather simple and straightforward.

The procedures and forms for constructing task inventories and analyzing occupational performance described in this manual have been used by The Center for collecting information in three occupational areas. The three areas were: (1) automotive mechanics, (2) business data processing, and (3) secretarial science.

The success of The Center's efforts in these three occupational areas, along with the kinds and quality of data collected, has caused the project staff to judge the task inventory approach to be a more efficient and superior method for collecting occupational performance data than conventional task and job analysis techniques.

Definition Of A Task Inventory

A task inventory is a list of appropriate duty and task statements covering the tasks performed by workers in an occupational area. It may also contain identification and background information and may be used to collect occupational information from incumbent workers.

Advantages Of The Task Inventory

Several advantages have been claimed for the task inventory analysis technique.[2] Some of them are:

1. The technique is economical. Data can be collected from hundreds of workers in an occupational field for less than it would cost to collect data from a few cases using professional job analysis.

2. The information collected is quantifiable. The number of people performing any given task can be counted and their characteristics described.

3. Since the data collected by task inventory techniques are quantifiable, they can be stored, manipulated, analyzed, and reported by computer.

4. The results of the task inventory can be validated and checked for stability using conventional statistical techniques.

5. The technique yields information that is accurate. Workers do not inflate their job descriptions in terms of the number or difficulty levels of tasks reported. There is a high probability that significant tasks missing from the inventory will be written in by workers who perform them.

Uses For The Data Collected By Task Inventories

The information gathered using task inventory techniques for occupational analysis has several uses. Some of these are:

1. To determine what different jobs and tasks exist, their relation to each other, and what the incumbent of each job is required to do. Detailed job and task descriptions can be developed for all job types within the occupational area.

2. To determine job differences and relationships to be used in identifying and structuring specific jobs into career fields and career field ladders.

3. To determine training that can be reduced or eliminated. Obsolete subject matter can be identified and removed from existing curricula.

4. To determine the critical tasks that should be taught in a vocational or technical education program.

5. To determine the critical tasks that should be included in occupational competency and certification tests.

6. To serve as a counseling aid to help students to get realistic perceptions of occupations.

Definitions Of Terms

1. Task—A unit of worker activity that is intermediate in specificity between a function and a procedural work step or action.[3] It is a discrete unit of work performed by an individual; that is, the unit usually has a definite beginning and ending, and it is performed within a limited period of time. Some sample tasks for an automobile mechanic are these:

Solder minor leaks in radiator
Repair oil pumps
Replace flywheel ring gears

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[1] Joseph E. Morsh and Wayne B. Archer, *Procedural Guide for Conducting Occupational Surveys in the United States Air Force* (Lackland Air Force Base: Personnel Research Laboratory, 1967).

[2] Raymond E. Cristal, "Implications of Air Force Occupational Research for Curriculum Design," *Report of a Seminar: Process and Techniques of Vocational Curriculum Development* (Minneapolis: Minnesota Research Coordinating Unit for Vocational Education, University of Minnesota, 1970), pp. 26-61.

[3] While job analysis experts employ concepts such as task, function, responsibility, duty, etc. as though the distinctions among them were both obvious and fixed, this is simply not true. The curriculum designer should be warned that any attempt by him to place these terms into a reliable hierarchy may turn out to be not very rewarding.

A task statement is composed of two basic elements, a specific action verb and a brief identification of what is acted upon. On occasion, a qualifying phrase may be added for clarity. For example:

Compute product moment correlations on a desk calculator

2. Duty—A large segment of work performed by an individual. It is one of the distinct major activities involved in the work performed, and it is composed of several related tasks. Sample duties of an automobile mechanic might be:

Performing maintenance control functions
Maintaining and repairing power trains
Maintaining and repairing cooling systems

Additional sample duty statements can be found in Appendix A.

As a convention, action words ending in "ing" (gerunds) are generally used to designate duties.

3. Job—The duties and tasks actually performed by a specific individual. An automobile mechanic may have one of several job titles depending on where he works. Common titles are mechanic, service manager, service writer, and garage owner.

4. Job Type—A group of jobs that are composed of essentially the same significant duties and tasks. The term job may be used in place of job type where it is obvious that the collective term is meant (e.g., junior programmer, receptionist, service manager, etc.).

5. Position—The duties and tasks established as the work requirement for one individual. A position exists whether occupied or vacant.

6. Occupational Area—A group of jobs that are related on the basis of required skills and knowledge.

7. Career Ladder—A vertical arrangement of jobs within an occupational area to indicate skill distinction and progression.

8. Occupational Survey—The procedure for collecting data to identify the duties and tasks that comprise one or more jobs, job types, or career field ladders, for the collection and analysis of information concerning such duties.

9. Occupational Survey Report—The report summarizing the results of an occupational survey. It includes distribution information about individuals participating in the survey and duty- and task-level job descriptions of significant job types found among the incumbents surveyed.

10. Task Inventory—An instrument used for conducting an occupational survey. It consists of items of identification and background information and a list of appropriate duty and task statements.

Overview Of The Task Inventory Analysis Procedure

The task inventory analysis procedure uses conventional survey methods for constructing and validating occupational analyses. This procedure is comprised of several distinct steps, the exact number depending on who prepared them and the extent of detail he believes important. In this manual, some seventeen steps have been set forth. Since the remainder of this report is directed at explaining how each step might be performed, it will be more useful at this time to show the general framework within which these steps fit rather than to present the actual steps.

Developing and using a task inventory involves three main phases. These phases, along with some of the goals and activities of each, are:

1. Construction of Initial Inventory of Tasks. Here the goal is to generate a comprehensive inventory of duties and tasks for a given occupational area, using various standard sources of information. With the aid of experts, statements are refined and grouped and made ready for administration to job incumbents.

2. Acquisition of Information about Each Task. In this phase, the inventory of tasks is submitted in questionnaire form to a large group of job incumbents. After each incumbent provides certain background information about himself, he checks each task in the inventory that he actually performs. Following this, he indicates the relative amount of time he spends performing this task compared with other tasks that he does on his job. On occasion, incumbents may be asked to provide other information about the tasks that they perform.

3. Analysis of Task Data. Once questionnaires are returned and checked for completeness, responses are tabulated and summary statistics derived. The results can then be used to guide the development or revision of training programs.

These three phases have been formed into three separate chapters, and the set of steps associated with each phase is discussed in the corresponding chapter. Also, to help the reader keep track of his progress, the steps have been numbered consecutively across the three chapters. Thus, Chapter II contains steps 1-6, Chapter III steps 7-12, and Chapter IV steps 13-17.

Self-Test Items

These items are designed to help the reader evaluate his learning of the concepts and terms introduced so far. The reader should review the chapter again if he is not sure that his answers are acceptable. Suggested answers are given after all questions are posed.

Q.1. If someone asked you how many steps were involved in constructing and analyzing a task inventory, how would you answer him?

Q.2. Check which of the following you believe to be an adequate task statement.

_____ 1. Order spare parts
_____ 2. Sign letters

_____ 3. Transcribe (type) shorthand notes
_____ 4. Make carbon copies
_____ 5. Repair automobile engines
_____ 6. Manage the classroom
_____ 7. Direct work flow
_____ 8. Schedule workers' vacations
_____ 9. Plug in electrical equipment
_____10. Remove intake manifolds

Q.3. There were five advantages of the task inventory analysis technique mentioned. How many can you name?

Q.4. Of the six uses of task inventory data cited, which one is probably of greatest interest to the curriculum designer?

A.1. The number of steps depends greatly on the amount of detail introduced. As number of details increase and activities are separated, it is convenient to maintain these separations by designating different steps.

A.2. You should have checked statements 1, 3, 8, and 10. Statement 2 is a step in the performance of some other task, say "Write business letters." Statement 4 is also a single step (component step) in a complete task. Statement 5 is a duty-level behavior; it includes many tasks. Statements 6 and 7 sound like tasks but they fail to qualify because they do not have definite beginnings and endings. For example, one must manage the classroom throughout the instructional period. Statement 9 is a component step, something one does while engaged in performing a task.

A.3. Check your answers against the relevant section.

A.4. It is assumed his primary problem is to develop needed training programs; therefore, his greatest interest would likely be number 4, "To determine the critical tasks that should be taught in a vocational or technical education program."

CHAPTER II
CONSTRUCTION OF INITIAL INVENTORY OF TASKS

Step 1: Define Scope Of Performance Situation

At the outset it is necessary to decide on the breadth of the intended occupational training program, that is, whether it will be for one specific job or for a cluster of related jobs. The decision has obvious implications for the construction of the inventory and for its subsequent administration. If task statements are kept quite specific and jobs are clustered rather broadly, the number of statements in the inventory will be large and the analysis cumbersome. The use of more general statements of work activity would reduce the volume of associated work, but this would also render the inventory results less useful.

To avoid lengthy and possibly fruitless discussions in this matter, it is recommended that the user of the manual plan to design training programs intermediate between the two extremes alluded to above. Thus, for example, instead of building a program solely for training a legal secretary, let's say that the interest is in devising a program for a cluster of closely related secretarial jobs. They could include the legal secretary, plus medical secretary, executive secretary, general secretary, etc. Having made this decision, the curriculum designer can then proceed with plans for constructing and analyzing a task inventory. The point to be made is that this decision must be made prior to any attempts to construct an inventory, and the decision must be made by the curriculum designer. His perception of the community needs, as well as his estimation of the capabilities of his staff to design the necessary instruction, will likely be the primary factors affecting his decision.

Step 2: Locate Written Sources Of Activity Statements

The initial task inventory is constructed from available published source materials. The first step is to identify the available sources by a search of publications, indexes, catalogs, and other references. The acquisition of reference materials should start well in advance of the actual construction of the initial task inventory to allow for lag time between the location and receipt of some materials. Following is a list and a discussion of possible task sources that are available.

1. *Abstracts of Instructional Materials in Vocational and Technical Education* (AIM)

This document includes abstracts of materials typically designed for teacher use or student use in the classroom, and annotations of bibliographic or lists of instructional materials for vocational and technical education. AIM is published quarterly. Two basic formats—resumes and indexes—are used.

2. *Abstracts of Research and Related Materials in Vocational and Technical Education* (ARM)

This document incorporates abstracts of research and other materials that are useful to a wide audience of users, such as researchers, supervisors, teacher educators, education specialists, administrators, teachers, and others who have an interest in vocational and technical education. ARM also has two basic formats—resumes and indexes. The document is published quarterly.

3. *Publications of the American Association of Junior Colleges* (Washington: American Association of Junior Colleges) 1970, 12 pp.

This current list of publications of the American Association of Junior Colleges includes guidelines for program planners, facility guides, curriculum guides, and a wide variety of assorted publications useful to those responsible for initiating and conducting post-secondary vocational and technical education programs.

4. Previously Constructed Task Inventories and Job Analyses

A. The U.S. military has used task inventories for several years and copies of their inventories provide excellent sources of task statements. They are available from the Personnel Research Laboratory, Lackland Air Force Base, Texas 78236, and Headquarters, U.S. Marine Corps, Office of Manpower Utilization (A Field Activity, G-1 Division), Marine Corps Development and Education Command, Quantico, Virginia 22134. An additional source of both military and civilian inventories and analyses is the Human Resources Research Organization, 300 North Washington Street, Alexandria, Virginia 22314.

B. The Center for Vocational and Technical Education at The Ohio State University has constructed some task inventories and these are available through the Educational Resources Information Center (ERIC) system. These and other task lists can be located through AIM and ARM.

5. Curriculum Guides

Many curriculum guides contain some type of task analysis or job analysis. While these vary in detail and completeness they can serve as useful sources of task statements.

Step 3: Draft Task And Duty Statements

Coverage of the Task Inventory. As noted in Step 1, the number of task statements in an inventory is dependent largely on the scope of the occupational area for which task information is to be sought. It was recommended at that time that the curriculum designer focus his interest on a cluster of closely related jobs. That recommendation still holds. This means that the inventory that he now plans to construct should cover an occupational area that may include several job types, all requiring similar skills and knowledge. Also, the

inventory should be designed to cover all levels of a particular career or promotion ladder. However, in some cases, say where there is a large cluster of management positions, it may be best to develop separate inventories, one for the management positions and one for skilled workers.

The task inventory should contain at least 200 and not more than 600 task statements. The maximum length is roughly determined by the number of tasks workers can be expected to respond to on a voluntary basis. Generally, you can't expect a worker to spend over one hour of his time completing the inventory. A study by Reuss[4] found that the higher the intelligence of the questionnaire recipient, the more likely he is to return the questionnaire; therefore, workers in jobs requiring higher verbal apititudes can be expected to complete and return longer task inventories than workers in lower level occupations that require very little verbal aptitude. For example, The Center's experience has shown that data processors and secretaries can be expected to fill out and return longer task inventories than automotive mechanics.

If a task inventory is constructed using less than 200 task statements, the statements may be so general that they yield little information about specific jobs. If, on the other hand, the inventory is too long, it probably includes unnecessary details. Consideration of this and related problems will be the prime topics of a subsequent section titled "Task Statements."

Duty Statements. Before assembling task statements into the preliminary task inventory, tentative duty categories must be established under which the task statements will be grouped. You will recall that a duty includes a relatively large segment of work performed by an individual. There are generally two types of duties in a task inventory. These are:

1. Supervisory activities, such as supervising, organizing, planning, directing, implementing, training, inspecting, and evaluating. They are placed first in the inventory.

2. Work performance activities, such as performing, maintaining, troubleshooting, repairing, removing and replacing, adjusting, and installing. They follow the supervisory duties in the inventory.

An object is frequently used with these action words in describing duties, e.g., repairing transmissions.

Other duty headings will be suggested by headings from organizational charts and curriculum guides. A worker in a particular job might perform a number of related tasks, which can logically be grouped together, and an appropriate duty heading written to cover those tasks. If few task statements, i.e., ten or less are found for a particular duty category, tasks under related duties may be combined. Examples of such duty combinations are organizing and planning, directing and implementing, and inspecting and evaluating. Thus, more than one action word may be used to designate a single duty category. Examples of typical duty statements are listed in Appendix A.

Task Statements. Several important issues arise in connection with the preparation of task statements. Analysts have been concerned with the complexity of such statements, their content and structure, and, perhaps most of all, their relative specificity. The last problem has been most troublesome. How specific should task statements be? Well, one thing we know: they must be specific enough to give the curriculum designer the information he needs to be able to develop an effective and efficient course of instruction. If we make them too specific, we may end up with a cumbersome number of statements and have more detailed information about worker performance than we can incorporate in a training program. If we make them too general, we may lose information about important activities, reduce communication among analysts and curriculum designers, and end with such general conclusions that no effective guidance is provided.

Fruchter, Morin, and Archer[5] have come to grips with some of the problems associated with preparing task statements, and it will be helpful to review their conclusions. Noting first that it is possible to distinguish the what and how aspects of work activities, they wonder whether task statements should contain both elements. Here are a couple of examples they give:

	What	How
1.	Calculate correlation coefficients.	Use fully automatic desk calculator.
2.	Do single classification analyses of variance.	Use IBM 650 computer.

While they acknowledge that statements containing both elements would provide potentially more useful information than would statements containing only one element, they feel that using all meaningful combinations of whats and hows could lead to an inventory of unmanageable length. They concluded, therefore, that it is better to make separate statements.

A similar problem prevails if one focuses on the purpose of an activity. A statement like "Calculate correlation coefficients for factors analyses" is an example. Fruchter *et al.* recommended against the use of such statements. One reason, of course, is that the activity may be performed for a variety of purposes. In the example, the calculation of a correlation coefficient is the same process, whether for factor analysis or for some other purpose.

[4] Carl F. Reuss, "Differences Between Persons Responding and Not Responding to a Mailed Questionnaire," *American Sociological Review*, August, 1943, pp. 433-438.

[5] B. Fruchter, R.E. Morin, and W.B. Archer, *Efficiency of the Open-Ended Inventory in Eliciting Task Statements from Job Incumbents* (Lackland Air Force Base: 6570th Personnel Research Laboratory (AMD/AFSC), March 1963).

Developing a task inventory in which all statements are equal in specificity was judged by Fruchter *et al.* to be a theoretically laudable but practically impossible undertaking. They questioned the merit of insisting on such equality, concluding that the level of specificity one needs in a given situation should form the criterion of adequacy. They feel there is probably no one ideal level of specificity.

A final problem raised by these authors centered on the need for grammatical consistency. They insisted on a straightforward verb-object construction (Repair fuel pumps), eliminating modifying phrases as much as possible (Check fuel system for cleanliness). As a further expression of this consistency, they recommended the use of a single verb in each statement. Thus, statements containing multiple verbs like remove and replace, type and proofread, inspect and repair, etc., were generally rejected even though the worker might regard the two actions as part of the same task. The present manual recommends that the curriculum designer make his own decision in this matter, permitting him to use multiple verbs where he feels they are justified.

General Guidelines. Several considerations should be kept in mind when constructing, reviewing, and editing task statements. Here are some of the most helpful matters:

1. Purposes to be Served by Task Information. Each task statement should be written in the context of the uses to be made of the information derived from it. In general the statement should serve one or more of the following purposes:

A. The task statement should elicit responses that differentiate between workers in different job types within the occupational area.

B. The task statement should elicit responses that differentiate between managers and supervisors, supervisors and journeymen, and journeymen and apprentices.

2. The Worker Responding to the Task Statements. In considering the worker who responds to the job inventory, each task statement should conform with the following ground rules:

A. The task statement must be clear so that it is easily understood by the worker.

B. The task statement must be stated using terminology that is consistent with current usage in the occupational area.

C. The task statement should be brief to save reading time of the worker.

D. The task statement must be written clearly so that it has the same meaning for all workers in the occupational area.

E. Abbreviations must be used cautiously since they may not be understood throughout the occupational area. It is good practice to spell out the term and follow it by the abbreviation in parentheses where it first appears in the inventory. In later usage the abbreviation may stand alone. However, it is best to avoid abbreviations whenever possible.

F. The task statement must be worded so that the task rating scales make good sense when applied to it.

G. The task statement must be ratable in terms of time spent and other rating factors. This eliminates skill, knowledge, and responsibility items that begin with such words as "Have responsibility for . . . ," "Know how to. . . ," "Understand. . . ," "Have knowledge of . . ." Such statements found in source materials should be written as two or more activity task statements (e.g., "Maintain files" or "Supervise maintenance of files," NOT "Have responsibility for maintaining files.").

H. Vague or ambiguous words, such as "check," "assist," "coordinate," "recommend," "determine," "assure," should be avoided.

I. Short words should be used in preference to long words or expressions (e.g., "Fill out work orders," NOT "Prepare forms for vehicle repairs to be accomplished by mechanics.").

J. The qualifications a worker has, such as intelligence, aptitude, knowledge, education, skill, training, and experience are not tasks and are not included in the duty-task section of the job inventory. Information with regard to certain qualifications, such as training, education, and work experience, however, may be obtained by including appropriate items in the background information section of the inventory.

K. Receiving instruction is not included as a duty or task unless actual useful work is performed during the training. Thus, classroom instruction, laboratory or shop instruction, and the coaching a person receives are not tasks. On-the-job training, however, may include the performance of tasks under a supervisor. These tasks are listed in the inventory the same as any other tasks. Giving instruction, which is a supervisory duty, is included under "Training."

L. The task statement should begin with a present tense action word with the subject "I" understood (e.g., "Operate," "Write," "Clean," NOT "Operates," "Writes," "Cleans.").

M. Task statements are arranged alphabetically under each duty. This order shortens the incumbent's reading time and assists him in recalling tasks that are not listed. For example, the incumbent can easily scan through a list of tasks beginning with the word "Inspect" to make sure that all the inspections he performs are in the inventory. The alphabetical arrangement also helps the inventory constructor eliminate duplicate tasks.

3. Task Statement Format to Facilitate Analysis. Each task statement must appear in a format that is consistent with a functional orientation and is compatible with the computer

programs that have been developed to analyze the data obtained. The following guidelines should be followed:[6]

A. Task statements should be limited to 117 spaces and not more than two lines.

B. The task statements are numbered consecutively, beginning with 1 under each duty heading.

C. Each task statement must be specific and capable of standing alone. An item such as "Operate other types of equipment" is meaningful to an incumbent if listed at the end of a series of "Operate . . . equipment" tasks. However, later, in the consolidated job descriptions to be prepared from the results, the tasks are not printed in the same order as in the inventory. Thus, the original context is destroyed, and an item like "Operate other types of equipment" cannot now be interpreted.

D. Each task statement must be a complete sentence. Do not use an action subheading followed by a series of objects. For example:

1. Type and correct offset masters
2. Type and correct spirit masters
3. Type and correct stencils

NOT: Type and correct the following:

1. offset masters
2. spirit masters
3. stencils

E. The period at the end of the task statement is omitted.

F. Use "such as" followed by two or three samples. Avoid "and/or" and "etc." (e.g., "Type cards, such as index cards, file cards and 'address finder' cards," NOT "Type cards, such as index cards, file cards, and/or address finder's cards, etc.")

G. Parallel tasks should appear in appropriate duties. For a task listed as being supervised there should almost certainly be a related task which is performed. Equipment to be inspected is also likely to be repaired and/or replaced.

H. Use simple statements without qualifiers unless the qualifier is essential to the meaning of the statement (e.g., "Operate paper cutter," NOT "Operate paper cutter to cut paper," but "Schedule employees for on-the-job training," NOT "Schedule employees.").

I. If a modifier is needed for greater specificity, be sure to include all other significant tasks with comparable modifiers. For example, in an automotive mechanic inventory, "Repair transmissions" would not be specific enough. Therefore, if the statement were modified to read "Repair automatic transmissions," then "Repair standard transmissions" should also be added.

J. Avoid tasks that are obviously too specific or trivial (e.g., "Operate fork lift," NOT "Turn ignition key," "Shift gears," "Elevate fork.").

K. Avoid tasks that are too general. Such tasks will not differentiate job types (e.g., "Repair carburetors," "Repair standard transmissions," NOT "Repair motor vehicles.").

L. In general, avoid multiple verbs in a task statement, unless several actions are invariably performed together (e.g., "Erect and align poles," but NOT "Inspect, tow, and repair engines or equipment.").

M. As far as possible, tasks included in the job inventory should be independent. Avoid overlapping task statements (e.g., "Prepare lesson plans" might be used with "Maintain instructional records or charts," but NOT with "Prepare lessons.").

Background Information Section. The background information section of the task inventory is used to obtain information about the job incumbent. It asks for information about the location of his job, his previous work experience, source of training, and other job related information apart from the specific duties and tasks performed. Care should be exercised so that only relevant information is included. The background information section should be brief and relevant since the response rate of the workers surveyed is inversely proportional to the total length of the task inventory. The following types of background information are usually required:

1. Identification information
   - A. Date
   - B. Identification number (to identify the individual respondent)
   - C. Job Title
2. Type of business employed by
3. Work experience
4. Education and training information

Examples of background information questions used by The Center are presented in Appendix B.

Step 4: Obtain Knowledgeable Consultants To Review Initial List

After the preliminary task inventory has been constructed from source materials, interviews are conducted using consultants from the occupational area to refine and revise the inventory prior to administering it to a sample of workers. The purpose of the review is to add missing task statements, delete obvious irrelevant tasks, and improve the wording of vague or lengthy task statements.

[6] Morsh and Archer, *Op. Cit.*, pp. 8-11.

Consultants should be selected for their job knowledge and practical experience in all aspects of the occupational area. If several specific job titles are covered by the task inventory, it is advisable to obtain at least one incumbent or supervisor of each job title. A supervisor that directly supervises several job titles is usually more desirable as a consultant.

In selecting informants, one must be flexible. It is not possible to know at the outset which consultants will give the best and most complete information, nor precisely how many interviews will be required. Conclude the interview review when it is believed that the preliminary form is well structured and essentially complete. From three to eight interviews are adequate for most inventories. However, as a rule and to the extent practicable, the more interviews, the better.

Whenever possible it is desirable to interview consultants from several different businesses or companies. This avoids getting only the organizational structure and work breakdown of a single establishment. In most cases it is possible to find consultants who are willing to take a couple of hours to sit down and to go over the preliminary inventory. However, if funds are available, it may prove worthwhile to pay the consultants a nominal fee to insure their full attention to the review. Generally, the fee paid should be equal to or greater than their current hourly wage.

Conduct of the Review. Before beginning the review of the preliminary task inventory, the purpose and uses of the task inventory should be explained to the consultant. The consultant should clearly understand how the tasks are to be stated and how specific they are to be.

The consultant should then be shown a list of the duty headings. These are reviewed one by one for clarity and accuracy. If the consultant points out duties that are missing from the list, they should be added.

After completing the review of the duty headings, the consultant is then given a copy of the job inventory, and the individual tasks are reviewed. The supervising duties, such as organizing and planning, inspecting, evaluating and training are postponed until last. Beginning with the first non-supervisory duty in the inventory, the interviewer should read each task statement aloud and ask leading questions about the particular task. Following are examples of the types of questions to be asked:

1. Is the task statement clear? Will everyone understand what this means?
2. Is this task covered by a previous task statement?
3. Does this task fit better under another duty?
4. Are there any other tasks that should be under this duty?
5. Is this task performed in your business?
6. Is this task performed by any workers in the occupational area?

The interviewer should not attempt to secure perfectly polished task statements in the interviews but should accurately record the main substance of the new statements and revisions in a form that can be edited later. The consultants should not be considered experts on how to write task statements but should be used to review the substantive content task statements.

All tasks under a duty heading should be covered before going on to the next duty. When the non-supervisory duties are completed, the supervisory tasks are reviewed. These are left until last for two reasons: (1) Because of the ongoing nature of many supervisory activities, it is more difficult to write specific, time-ratable supervisory items. The review can become bogged down if supervisory tasks are taken first. By taking them last, the consultants will have had some practice with easier items. (2) The non-supervisory tasks are regarded as the central tasks of the career area, and, therefore, comprise the main body of the inventory. If the non-supervisory duties or tasks are changed in any important way during the review, it may be necessary to revise the supervisory sections accordingly. For example, if new non-supervisory duties are added, parallel tasks should be added to cover the supervision of those duties.

The background information section should also be reviewed during the interview. Although most items are standard and need not be reviewed, the consultant can react to the clarity of the questions. The purpose of these items is: (1) to describe the workers surveyed, (2) to answer questions of interest to users of the survey data, and (3) to help distinguish among significant job types or special worker groups. From the informant, then, the interviewer may obtain additional items that will help to describe further the workers to be surveyed.

Step 5: Edit And Group Items

When the interviews are completed, all preliminary inventory booklets that were used during the consultant reviews are assembled. All revisions, new task statements, and comments of the consultants are copied from these sources into a single booklet.

Final decisions to accept or reject the proposed changes are made by the persons who constructed the preliminary task inventory and conducted the consultant interviews. Further consultation with a technical consultant may be necessary for some items, especially if conflicting revisions or suggestions have been given by the informants. Most of these problems can be solved by reference to a published source or by a telephone call to an authority in the field.

Once these decisions have been made, all items (especially new or revised ones) must be checked to determine whether they are consistent in format. As a minimum, each statement should have a single action verb and an item acted upon. Only

when it is necessary for clarity should a modifier or qualifier be used.

In terms of organizational format, all statements falling under a duty should be arranged alphabetically by the action word, e.g., adapt, build, compose, etc. This will help the respondent detect missing information and reduce the time he spends completing the inventory. Future modifications to the inventory are also easier to make.

As an additional aid to the respondent (and also to the analyst), the tasks within a duty may be grouped or categorized into major sections. Hopefully, these groupings will seem natural to the incumbent, thereby helping him make his judgments. Duty statements may also be grouped, but the usefulness of such groupings will depend upon the scope of job knowledge possessed by the curriculum designer.

Step 6: Pilot Test Items

Before putting the duty and task statements into a formal, printed questionnaire it is a good idea to try them out on a few incumbents. A draft form of the questionnaire will be adequate for this purpose. The goal here is to obtain some firsthand feedback from incumbents about the communicability of the statements. To do this, the developer of the inventory locates a few job incumbents who are, hopefully, representative of the full range of incumbents who will eventually answer the questionnaire, and asks each one individually to read each statement. The respondent is asked to comment on any statement that appears confusing to him. The specific reason for the confusion should be obtained, if possible, and suggested revisions devised with the incumbent's help.

It should be clear that the respondent is not asked at this time to indicate whether he performs a given task, but rather to indicate his comprehension of the statement of each task. It is the clarity of each statement that is being pilot tested, not the adequacy of the statements to describe what the incumbent does.

Since administration of these statements to the several incumbents is likely to be time-consuming, especially if the worker finds the statements difficult, it will probably be necessary to pay each respondent for his time. The fee paid should be equal to or greater than the respondent's hourly wage.

Self-Test Items

These items are designed to help the reader evaluate his learning of the concepts and terms introduced in Chapter II. The reader should review the chapter again if he is not sure that his answers are acceptable.

Suggested answers are given after all questions are posed.

Q.1. There were five possible task sources listed. How many can you name?

Q.2. How many task statements should a task inventory contain?

Q.3. How specific should task statements be?

Q.4. There were thirteen ground rules mentioned with which each task statement should conform. How many can you list?

Q.5. There are two types of tasks in the following list. Place an "S" by those you consider supervisory and a "W" by those that are work performance in nature.

___ 1. Develop plans for performing maintenance.
___ 2. Check and correct bearing fit.
___ 3. Diagnose valve train and head malfunctions.
___ 4. Determine actual cost of vehicle repairs.
___ 5. Establish methods to improve maintenance procedures.
___ 6. Analyze and repair electrical control circuit for overdrive unit.
___ 7. Perform operational manual transmission inspections.
___ 8. Resolve technical problems.
___ 9. Analyze malfunctions in the cranking system
___10. Keep manuals and special bulletins up to date.
___11. Analyze for moisture or foreign particle level in fuel system.
___12. Perform visual inspections of suspension systems.
___13. Check vehicle maintenance for compliance with warranty policies.
___14. Estimate cost of vehicle repairs.
___15. Perform cylinder balance test.

A.1. Check your answers against Step 2.

A.2. The task inventory length is roughly determined by the number of tasks workers can be expected to respond to in an hour of their time. This would vary from 200 to 600 task statements.

A.3. Task statements must be specific enough to give the curriculum designer information he needs to develop a course of instruction.

A.4. Check your answers against the relevant section.

A.5. You should have marked statements 1, 4, 5, 8, 10, 13, and 14 with an "S." Statements 2, 3, 6, 7, 9, 11, 12, and 15 are work performance in nature rather than supervisory.

Step 7: Determine Task Information Needed

Before asking incumbents to complete a task inventory questionnaire, we must first decide what questions to ask. As a rule, we want to ask questions that will aid directly in the design and development of a training program. However, with respect to the performance of a given task, there are many questions one might ask. Also, we know that there is a direct relationship between the number of questions we ask and the time it takes to complete the questionnaire. For example, if we have 315 task statements and ask ten questions about each task, the job incumbent might have to make 3,150 judgments! It seems expedient, therefore, that we plan to use far fewer questions. Ideally, we'd like to ask those questions that will provide the greatest amount of information and guidance in the smallest amount of time.

In a recent study, Ammerman[7] indicated the factors he felt needed to be considered when selecting tasks to be included in training. He cited:

1. How often each task is performed by a job incumbent
2. How often each task should be performed
3. Proportion of job incumbents concerned with each task
4. Importance of each task to effective [business] operation
5. Existence of a discrepancy between what is done and what should be done by job incumbents
6. How soon task competence is expected after job assignment
7. Tasks for which all essential learning can be, and is being adequately acquired on the job in the time available
8. Tasks for which all essential learning has occurred prior to school attendance
9. Tasks on which job incumbents are having difficulty in acquiring competence on the job
10. Tasks for which training difficulties are being experienced
11. Tasks for which procedures could be improved through school training efforts

Ammerman further concluded that to acquire data on these factors, a series of questions would need to be answered for each task by individuals who had current job knowledge. Because of the time involved, however, all questions in such a series need not be answered by all respondents. Thus, for some of the questions, the supervisor would be a more knowledgeable consultant; for others, a job incumbent would be preferred. This would reduce the administration time considerably.

In the present situation, that is, in civilian occupations, where you are asking workers to fill out a questionnaire voluntarily, it is essential that the number of inventory questions be kept small. In fact, the two most basic items of information are probably these:

1. Does the incumbent perform this task?
2. What amount of time is spent performing this task compared with the time spent in performing other tasks?

These two questions have been used by The Center in its task inventory efforts, and they have apparently provided adequate information. Thus, they are recommended here for use, along with an acknowledgement that there may be occasions when they should be supplemented with questions like those cited by Ammerman.

To provide this information, the incumbent first checks each task he performs and then, for each such task, rates it on a time-spent rating scale.

Based on Air Force experience,[8] a seven-point rating scale has been found to give precise and reliable information. The incumbent is asked to make the following judgment about each task that he performs:

Compared with other tasks you do in your job, how much time do you spend on this task?

1. Very much below avarage
2. Below average
3. Slightly below average
4. About average
5. Slightly above average
6. Above average
7. Very much above average

The incumbent merely writes the number from the scale that corresponds to his estimation of time he spends.

Sample pages from questionnaires where this time-spent rating scale has been used may be found in Appendix C.

Step 8: Determine Appropriate Job Incumbent Sources

Probably the greatest problem in using the task inventory method for collecting occupational information lies in identifying and collecting information from the incumbent workers. A decision model for selecting worker samples is depicted in Figure 1, Selection and Location of Worker Samples.

How to Locate Worker Samples. Basically there are five

[7] Harry L. Ammerman, *Development of Procedures for Deriving Training Objectives for Junior Officer Jobs* (Fort Bliss: Human Resources Research Organization, Division No. 5 (Air Defense), May 1966).

[8] Morsh and Archer, *Op. Cit.*, pp. 18-20.

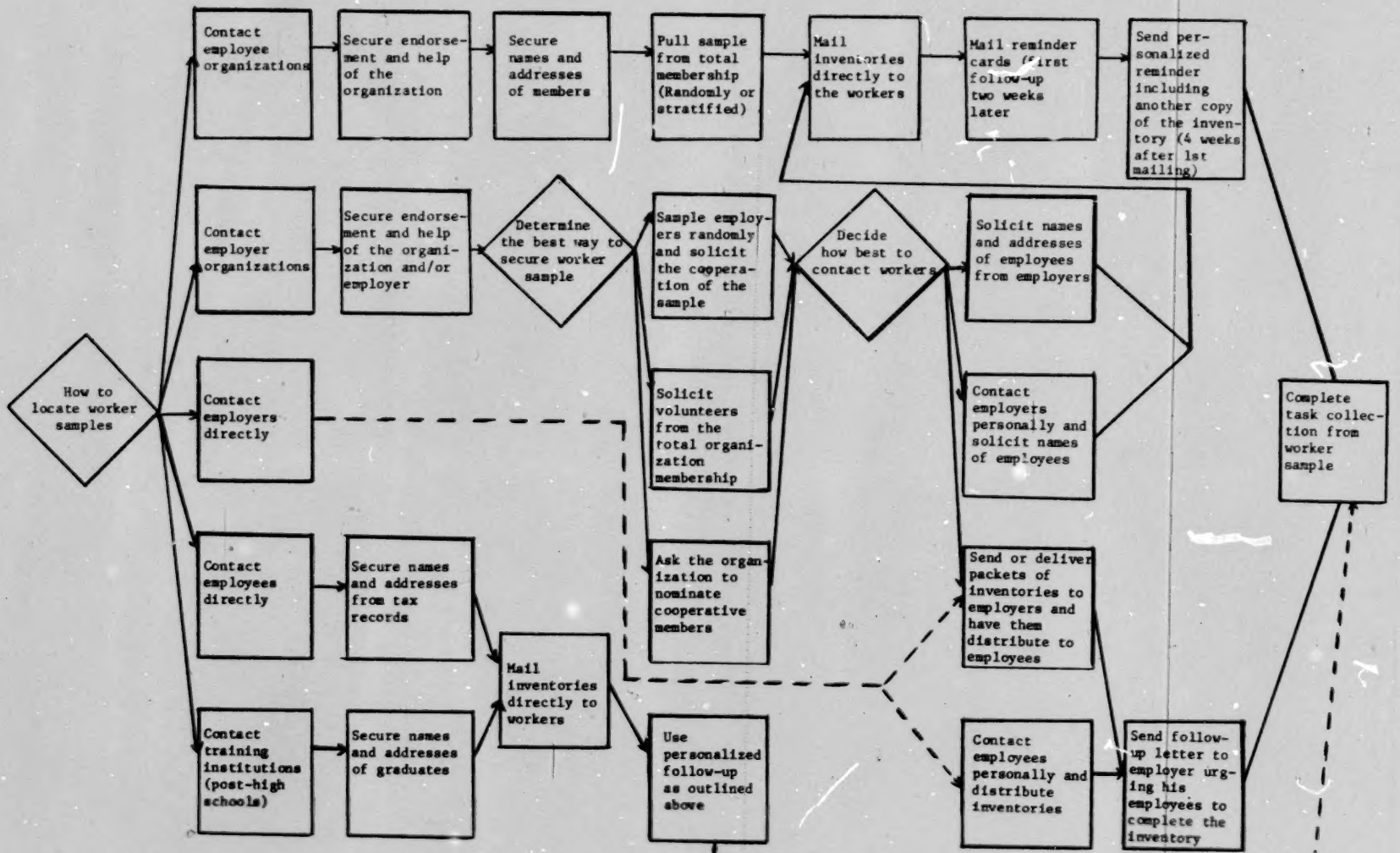
How to locate worker samples
Contact employee organizations
Secure endorsement and help of the organization
Secure names and addresses of members
Pull sample from total membership (Randomly or stratified)
Mail inventories directly to the workers
Mail reminder cards (first follow-up two weeks later
Send personalized reminder including another copy of the inventory (4 weeks after 1st mailing)
Contact employer organizations
Secure endorsement and help of the organization and/or employer
Determine the best way to secure worker sample
Sample employers randomly and solicit the cooperation of the sample
Decide how best to contact workers
Solicit names and addresses of employees from employers
Contact employers directly
Solicit volunteers from the total organization membership
Contact employers personally and solicit names of employees
Complete task collection from worker sample
Contact employees directly
Secure names and addresses from tax records
Ask the organization to nominate cooperative members
Send or deliver packets of inventories to employers and have them distribute to employees
Mail inventories directly to workers
Contact training institutions (post-high schools)
Secure names and addresses of graduates
Use personalized follow-up as outlined above
Contact employees personally and distribute inventories
Send follow-up letter to employer urging his employees to complete the inventory

Figure 1. Selection and Location of Worker Samples

ways to locate samples of workers. They are listed below in order of preference:

1. Contact employee organizations.
2. Contact employer organizations.
3. Go directly to employers.
4. Go directly to employees.
5. Go to training institutions (vocational-technical schools) and follow-up graduates.

If a union or other type of employee organization exists, it is best to go to this organization and secure its endorsement and help in administering the inventory to its members. Employee organizations can provide names and addresses of their members. This allows you to select a sample from the total membership if it is not too large. The task inventory experience of The Center staff has found that the quickest and most economical way to have workers respond to the task inventory is to mail the inventory directly to the worker and use a personalized follow-up to increase the response rate.

If an appropriate employee organization does not exist in the occupational area to be surveyed, the next most desirable method is to go to an employer's organization, such as the New Car Dealers Association, American Bar Association, or Chamber of Commerce. The endorsement of such organizations will help open the door to the individual employers. Several strategies are suggested for reaching incumbent workers once the employers are identified. These strategies include the following:

1. Solicit the names and addresses of employees from the employers by mail or telephone.
2. Contact employers personally and solicit names of employees.
3. Contact employers personally and have the employers distribute the inventories to their employees.
4. Go to the employer's business and personally distribute the inventories to the employees.

Through experience, The Center has found that employers are quite reluctant to release the names and addresses of their employees. They are generally suspicious as to why you are asking for this information. Therefore, it is advisable to ask the employer to distribute the inventories. The Center's experience has shown that employers, once they understand the purpose of the inventory, are quite eager to help and will often require their employees to fill out the inventories on company time. So that workers are not hostile to the questionnaire, employers may be encouraged to ask for volunteers from among the workers.

In the absence of any employer or employee organization, go directly to the employers or the incumbent workers. Employers can be identified quite readily through the yellow pages of telephone directories. Once the employers are identified, their employees can be contacted in the same manner as described above in working through employer organizations.

The last alternative is to go directly to the incumbent workers, if they can be identified, although this is the least desirable approach since we may incense the employer to the extent that access to the employees may become difficult.

If the curriculum designer has rapport with training institutions in his area, he may seek their help in locating graduates. It is possible that such institutions conduct follow-up studies of their graduates, and that they may be willing to provide needed names and addresses.

Step 9: Prepare And Pilot Test Questions

Once a decision has been made about the kinds of information to seek from incumbents, it becomes necessary to develop suitable questions that will elicit this information. These questions should then be pilot tested on a small sample of job incumbents. We want to find out whether incumbents can understand and answer the questions as stated. The form of the questions should be such that the incumbent need merely make an appropriate check mark opposite a task statement, or indicate by some other simple means the extent or "intensity" of his feelings on a statement. If the number of questions is small and the response required of the incumbent is simple, no real problems should appear. But, to make sure that the questions are clear and the nature of the desired response is straightforward, the inventory should first be administered to a few incumbents.

Ideally, the incumbents who assist in the pilot test of the questions should represent the range of incumbents, especially in terms of reading ability. It is not necessary in this step to employ strict sampling procedures to identify suitable incumbents. The main goal is to obtain some firsthand feedback from a sample of individuals who are members of the intended population.

Incumbents should be asked to comment on their understanding of the questions and the procedures to be followed. If they feel that certain changes in the wording of questions would improve their communicability, they should be encouraged to offer their suggestions. Similarly, if they have suggested changes in the procedures to be followed in completing the questionnaire, these should be incorporated.

The incumbent should be paid for his service, consistent with his hourly rate of pay.

Step 10: Develop Sampling Plan And Analysis Design

The need for some sort of sampling plan may arise, especially when an unusually large number of task statements are involved. But this situation is not too likely. After all, the curriculum designer has been working directly with the development and revision of statements for some time, endeavoring to keep their total number under 600. Thus, the possibility that he will suddenly find he has more than 600

statements is quite unlikely. Nonetheless, since the possibility exists, a plan can be devised whereby each incumbent will be required to respond to only a portion of the statements rather than to the entirety. This will drastically reduce the time needed by any one incumbent to complete the inventory.

A simple sampling plan would be to divide the statements into several groups or clusters, say about three or four. The basis for the grouping is not important. Thus, for example, if there were twenty duties represented in the inventory, all tasks in the first five duties might form one group, those in the next five another group, etc. The total number of statements in a group would not equal that of another group, but this does not matter as long as the statements are approximately the same. Now we prepare four forms of the inventory, one for each of the four groups of statements. Incumbents are assigned to one form of the questionnaire on a random basis. For example, the first incumbent is given Form A, the second incumbent Form B, etc. Even if incumbents should appear in career level groups, say all supervisors one day and all apprentices the next day, the procedure should insure that assignment to a particular form of the questionnaire is random. And, most important, each statement has approximately the same number of evaluations or judgments, but each incumbent has spent only about one-fourth the amount of time he would normally have spent. Incumbents must be informed that they are being asked to respond to only a portion of the total questionnaire. Therefore, they should not be concerned that the statements constitute an incomplete view of the job being assessed.

This approach will permit us to extract the same kinds of information that we would have obtained had each incumbent responded to all statements. This comment leads us to the second half of Step 10. You should remember that our basic goal is to obtain information that will guide us in the design of a training program. We want to know which skills and knowledge to include in our training program and which ones to exclude. To insure that we can get this kind of information, we must devise some plans by which the results may be analyzed.

First of all, we want to know the percent of incumbents who perform each task. Then, since we can't expect to provide training for all tasks, those with highest frequencies of performance will become candidates for inclusion in the program while those with lowest frequencies will be discarded. If we expect to devise a training program that will prepare people for any one of several closely related jobs, we might expect to start our program with the tasks common to all jobs, shifting later into special programs. This means we must plan to make comparisons of performance requirements among the set of jobs if we are to get the needed information.

Similarly, if we expect to devise multi-level programs in which some people will achieve only apprentice-level skills while others will continue training to higher level positions, we will need to have a tabulation of tasks performed by skill levels. The difference in task requirements between two skill levels, or between two job types, may be particularly helpful when devising training programs.

The curriculum designer is mainly interested in those items of information that accent tasks for which instruction is deemed critical to effective job performance. This information would help him focus his instructional planning on areas and behaviors most likely to be relevant and productive. With this kind of guidance, he could rapidly eliminate many tasks from consideration for inclusion in his training program, thereby increasing the chances that the final instructional program will be feasible in both time and cost.

A related problem is the need to identify tasks that, although performed infrequently, are highly critical. Tasks to be performed in emergency situations are examples (Remove injured personnel, Direct evacuation of building, Administer mouth-to-mouth resuscitation, etc.). Since they are performed infrequently and are tangential to the worker's main tasks, there's a good chance they will never become candidates for training unless some provision is made to identify them.

This is a good time to tell the reader, if he does not already know it, that the problems of curriculum design cannot be underestimated. While the discussion above may lead one to assume that task requirements can be translated directly into curriculum statements, this is simply not true. The design of instruction is still very much an art. Having definite information about typical performance requirements is far better than having no information, but this does not solve all one's problems. One can not include all task requirements in a training program, and thus far no one has come up with a systematic, foolproof scheme for deciding which ones are absolutely essential and which ones should be discarded.

Step 11: Print Questionnaire

When all pilot testing has been completed, all revisions made, instructions drafted, answer sheets designed, etc., the questionnaire is ready for printing. In addition to printing ample copies of the task statements, there's an equal requirement for copies of the other materials (instructions, etc.). In estimating the number of all materials to be printed, one should allow for additional "sample" copies to be sent to employers or other organizations assisting in the survey.

Instructions to Respondents. It is assumed that most questionnaires will be administered by mailing them to respondents and requesting they be returned by mail. Since there would be no opportunity for close control and supervision of the administrations, it is essential that the instructions for answering each question be as complete as is necessary to insure that respondents can fully and properly

answer them. For the sake of readability and understanding, these instructions should also be brief and concise, yet clear to the reader.

An example of such instructions would be:

INSTRUCTIONS FOR
SELF-ADMINISTRATION OF THE
TASK INVENTORY

In completing the inventory you are to respond in terms of your present regular job. Disregard any task that is not part of your regular assignment, no matter how often you did it in the past. Additional tasks you do for a few days while someone is away are not to be reported. In recalling tasks, go back far enough in time to get a true picture of your job. If your work changes from one season to another, you may have to go back a full year. If there was a permanent change in your duty assignment during the past year, go back to the time just after this change. You probably will need to go back not less than three months or more than a year.

Accomplish the following steps in order:

1. Fill in the Task Inventory Background Information. Be sure you provide all information asked for.
2. Beginning with Duty A, read each task statement under every duty in the inventory. As you read, place a check mark in the check column beside each task you do.
3. When you finish all statements in a duty, add (write in) all tasks you do that are not listed. If some tasks do not fit under any duty, write them in on the blank page at the end of the booklet. Be very thorough about adding tasks. This is an essential step in completing the inventory.
4. When you have finished all duties, turn back to Duty A again. Now make a TIME SPENT rating for each task you have checked or added. The seven-point rating scale you are to use is at the top of each page. TIME SPENT means the total time you spend on each task you are rating, compared with the time you spend on each of the other tasks you do. Remember that you are comparing only your own tasks with each other. Be sure to rate every task you checked or wrote in.

Additional sample instructions to incumbents may be found in Appendix C. Specific instructions for returning questionnaires need to be included in the packet mailed to respondents. A properly addressed envelope with the correct postage already affixed should be included.

For possible use at a later time, each copy of the questionnaire should be assigned a number by the curriculum designer. This will help him keep an accurate record of the disposition of questionnaires and will also aid in locating specific respondents should that become necessary.

Step 12: Administer Questionnaires

Administration by Mail to Individual Workers. When the names and addresses of the worker sample are available, a task inventory package is constructed and mailed directly to the incumbent workers. The package must be complete and should contain the following items:

1. An introductory letter stating the purpose of the study and containing the endorsement of the appropriate organizations
2. Instructions for self-administration of the inventory
3. The background information section
4. The task list with appropriate rating scales
5. An addressed and stamped return envelope for returning the inventory
6. An incentive for completing and returning the task inventory

It is important that an introductory letter accompany the inventory when mailed to the workers. Hopefully, this letter will develop a positive attitude in the worker toward the inventory. The endorsement and signature of the president of the employee or employer organization is helpful. Examples of introductory letters used by The Center are included in Appendix D. A sample of the task inventory format used by The Center is displayed in Appendix E.

A study by Pucel, *et al.*[9] found that questionnaire return rates can be increased by use of incentives. Based on his findings and those of others, a complimentary pen was included in all task inventory packets sent out by The Center. An Ohio State University football schedule was also included in the packets sent to the automotive mechanics who were Ohio residents. The logic for including the schedule was that automotive mechanics might want to identify with The Ohio State University football team. It was felt that, by sending a football schedule to them, they would have a sense of identity with the University, and would be more willing to complete and return the questionnaire.

A two-part follow-up was used with all non-respondents to increase the total return rate. One week after the initial mailing of the task inventory package, a reminder card was sent to all workers in the sample that had not returned their inventory. Three weeks after the initial mailing, a personal letter and a second copy of the inventory were sent to all non-respondents. Examples of the follow-up instruments used by The Center can be found in Appendix F.

[9] David J. Pucel, Howard F. Nelson, and David N. Wheeler, "Questionnaire Follow-up Returns as a Function of Incentives and Responder Characteristics." (Minneapolis: University of Minnesota, 1970).

Administration by Contact with Supervisors. When the names and addresses of the worker sample are not known, it becomes necessary to contact the employers. It is advisable to arrange a contact schedule to minimize the amount of time and travel. Approximately one week before a tentative contact is to be made, a letter of introduction should be mailed to the employer. A day or two before the tentative contact is to be made, the business should be telephoned for an appointment.

It is important that the normal lines of communication within an organization be followed. Initial contact should always be made with the owner, personnel manager, or the person having general responsibility over the employees. The objectives of the inventory and benefits or outcomes that will benefit the business or the employees should be explained. The occupational area being surveyed must be carefully defined so as to identify the kinds of employees to be included in the sample.

The interviewer, along with the employer or manager, should identify the kinds and number of employees who are to receive the inventory. Voluntary cooperation should be solicited without using coercive pressure. A positive and appreciative attitude toward the questionnaire is most desirable.

Each task inventory packet is a complete package for self-administration. The packet should contain the same items as the packet used when mailing directly to the workers. Some managers may prefer to distribute the packets, and then have the employees mail the completed inventories to the project personnel. Other managers may prefer to have their employees return the completed inventories to their office and they, in turn, will forward them to the project personnel. Experience has found that a slightly higher completion rate is obtained when the managers are interested enough in the survey to collect the completed inventories from their employees. If intermediate supervisors are to be involved in distributing the inventories, it is helpful if they are also personally contacted.

After the scheduled contact is completed and the cooperation of the business has been solicited, it is a good idea to send a follow-up letter thanking management for its cooperation. Approximately three to four weeks after the inventories have been distributed, a follow-up letter or telephone contact should be made with non-respondents by the project staff. Many times the lack of response is due to failure of the management to take the time to distribute the packets or forward the completed inventories collected from employees.

Self-Test Items

These items are designed to help the reader evaluate his learning of the concepts and terms introduced in Chapter III. The reader should review the chapter again if he is not sure that his answers are acceptable. Suggested answers are given after all questions are posed.

Q.1. What are the two basic items of task information most needed in querying job incumbents about their occupations?

Q.2. List five ways to locate worker samples.

Q.3. What is the primary purpose in preparing and pilot testing questions?

Q.4. How would you, as a curriculum designer, differentiate in task requirements between two skill levels?

Q.5. In administering questionnaires by mail to individual workers, which item in the task inventory package is most important?

A.1. (a) Does the incumbent actually perform his task? and (b) Amount of time spent performing this task compared with time spent performing other tasks

A.2. 1. Contact employee organizations
2. Contact employer organization
3. Go directly to employers
4. Go directly to employees
5. Go to training institutions and follow-up graduates

A.3. To ascertain if job incumbents can understand and answer the questions as stated

A.4. By designing a task inventory that would allow a tabulation of tasks performed by different skill levels

A.5. An introductory letter stating the purpose of the study and containing the endorsement of the appropriate organization

Step 13 Develop Inventory Record Procedures

A record should be kept of the places and persons to whom copies of the inventory are sent. Similarly, a record should be maintained of the inventories that are received from respondents. Keeping these records together will make it easy to detect delays in returns and to initiate follow-up efforts. At any time one should be able to calculate the percentage of returns of completed questionnaire.

When questionnaire booklets are received, they should be checked for completeness. Sometimes inventories are returned that are entirely blank or in which the background information section has been completed but the tasks are not rated. Incomplete questionnaires should be immediately eliminated from futher consideration.

A possible form on which to record actions taken with respect to the inventory is given in Appendix F.

Step 14: Key Punch Task Inventory Data

Usually the data can be key punched directly from the inventory booklets. For efficient and accurate key punching, the key punchers should not be required to edit or interpret the data to be punched. Before key punching is begun, accurate instructions and a complete code sheet for the key punchers should be prepared.

Accuracy in key punching the task inventory data is extremely important. Punch card errors produce costly delays and may cause errors in the data. For all task inventory data that is key punched it is absolutely necessary that it be 100 percent verified on a key verifying machine. This includes the background information as well as the task data.

If the number of respondents is large (1,000 or more), and if the designer's organization has the capability, recent improvements in optical scanners make it possible for task inventory data to be scanned electronically and transferred directly from the inventory booklets to magnetic tapes. This will save time and eliminate some of the cost of key punching. However, there is no scanner that will accurately interpret alpha information that has been entered by hand. Therefore, it will still be necessary for a staff member to scan the inventories and record the tasks that have been written in by the incumbent workers. This requirement is discussed further under Step 16.

Step 15: Compute General Summary Statistics

Once all information from the questionnaire has been collected, scanned, and key punched, the resulting data can be fed into a computer for analysis.[10] Perhaps the most useful analysis is that which provides a consolidated description of the jobs being performed by any group of workers of interest. For example, one might wish to see a description of the jobs performed by individuals in a given part of the country who operate a particular type of equipment, and who have been on the job for two years or less. A description like this can be prepared for any group of workers as long as they can be defined in terms of information in the background section of the inventory.

In planning the analysis of results (Step 10), we noted a possible interest in preparing multi-level training programs. Thus, worker experience could be one dimension on which summary data might be desired. A comparison of most frequent tasks performed by experienced persons with most frequent tasks performed by newcomers to the job might provide useful insights about the needed training content of multi-level programs.

A distribution of performance frequency in terms of kind of training initially received by incumbents could also be determined. Thus, one might wish to determine if persons trained on the job tended to perform different kinds of tasks than persons who received more formal training or instruction. If there was a definite difference, possible changes in the content of training, either in on-the-job training or in formal training, might be considered.

The reader will recognize that the greater the number of questions on the questionnaire, the greater the number of possible analyses. Also, he will recognize that, with respect to determining from the results those tasks for which instruction is critical, no direct analysis is possible unless a specific question about criticality has been asked. It might have been useful to include an item about this matter in the questionnaire. This would have called for a judgment from the respondents, and if they tended to agree, the solution would be clear cut. Of course, if there was a wide variance among respondents, little would be gained by such an approach.

In deciding whether a task (or cluster of tasks) should be considered for training, a criterion that has been used is the proportion of workers who claim they perform it. If the proportion is high, the task becomes a likely candidate for inclusion. If it is low, there's a good chance the task will be excluded. Determining what the size of the proportion should be for including or excluding a task is arbitrary. One can make a defense for various levels. In the examples that follow, the proportion of .7 (or 70 percent) has been chosen. This value has often been used in instructional situations when the instructor must determine which students pass and which fail, and it may have some attraction in the present instance. Therefore, that is the value that will be used. Here are several

[10] The kinds of analyses described here can be done by hand, but they will be expensive in time and manpower.

examples to show some possible kinds of analyses.

Suppose there were 360 task statements in an inventory. The results of an administration of the inventory to fifty workers showed that 213 of the tasks were performed by seventy percent or more of the incumbents. This means that at least thirty-five incumbents checked that they performed each of the 213 tasks. Since this is a large number of tasks to include in a training program, we may wish to reduce the number. One way to do this is to compare the relative time spent by workers in performing these tasks. To get this information we need to determine (calculate) the mean time workers spend on each task. So for each task we get the thirty-five (or more) scores or time-spent ratings. We add these ratings and then divide by the number of workers who checked the task. This gives us a mean time-spent rating. We do the same thing for each of the 213 tasks. When we have them all, we put them in a simple table. We can then apply a simple rule: If the mean time spent rating is 5.00 or more, we'll include it in our program; if it is less than 5.00, we'll exclude it. Here's what the table might look like:

Task No.	Mean time-spent Rating	Check if Rating is 5 or >
A-1	4.22	
A-4	5.61	√
A-5	4.97	
A-7	3.04	
B-2	5.06	√
B-3	4.19	
C-7	6.12	√
etc.	etc.	

Using the rule, we would incorporate Tasks A-4, B-2, and C-7. All others would be discarded. The rule, of course, is arbitrary, and there's nothing to prevent one from adopting a different rule. This is only an example of a possible approach.

If one wants to decide which of two tasks to include, a special distribution of responses of workers to these two items might be made. Suppose that of the fifty workers, forty-five (90 percent) reported they performed Task X-1, while thirty-five (70 percent) reported they performed Task Y-1. The relative time spent on the two tasks might be as follows:

No. Workers	Task X-1 Rating	Product
1	7	7
6	6	36
3	5	15
18	4	72
0	3	0
12	2	24
5	1	5
45	Sum	159
	Mean	3.53

No. Workers	Task Y-1 Rating	Product
4	7	28
2	6	12
20	5	100
6	4	24
1	3	3
2	2	4
0	1	0
35	Sum	171
	Mean	4.88

This table shows that, while more workers said they performed Task X-1, the mean time-spent rating on Task Y-1 was greater. Although this latter value did not reach 5.00, it is quite close, and the designer might decide to include it in his program rather than Task X-1.

Step 16: Record Additional Tasks Written In By Respondents

In anticipation of revising and updating the inventory for future use, each copy of the present questionnaire should be checked to retrieve any task statements written in by incumbents. As each questionnaire copy is examined, a list of potentially new statements should be prepared. Very little screening should be done at this time, but a statement should not be added if it is obviously nonsense, duplicates a statement appearing on the present inventory, or is a duplication of a statement already added to the list.

The new statements will likely vary widely in specificity, some being discarded immediately because they are too general and some because they are too detailed. Incumbents may use phrases and terms that are ambiguous, necessitating a clarification by subject matter experts. Statements will also likely not be in suitable grammatical form. The write-in information usually passes through the following three drafts:

1. Draft One: Raw Data. A typist sets up one page for each duty in the inventory and one for the blank page at the end of the inventory booklets. A duty heading is typed at the top of each blank page.

All inventory booklets are inspected for write-in comments one at a time. The written statements in all booklets are grouped according to the duty heading under which they were written. Each item is coded in the margin to show the number of the questionnaire from which it was taken.

2. Draft Two: Tasks Assigned to Proper Duties. Most new task statements and comments are written on the blank lines under the appropriate duty headings. To make task comparisons easier, the job analyst or someone else familiar with the inventory goes through Draft One and codes all tasks to show their proper duty sections. Some elimination of obviously unacceptable or duplicate items is also performed at this stage. The remaining items are transferred to Draft Two where they

are listed under appropriate duty headings. A margin of about one-third of the page is left on this draft for classification and disposition notes concerning each write-in item.

When Draft Two is prepared, all items are classified, edited, and finally marked "accepted" or "rejected." Explanations for final decisions and editorial instructions are entered in the margins of Draft Two.

3. Draft Three: Final Job Inventory Revision. All new tasks or revisions marked as "accepted" in Draft Two are transferred to a final draft. From this draft, a master copy of the revised job inventory is prepared. In preparing the final inventory revision, all of the new task statements are collated by interspersing them with the original statements in alphabetical order under each duty. The final revision is used as a basic source document for future surveys.

Step 17: Prepare Report of Analysis Results

After the results of the questionnaire have been analyzed and summaries of the data prepared, a formal report of the entire effort should be made. This report should describe the procedures that were used in developing and administering the questionnaire and the findings that were obtained. The report can provide a permanent record of the effort and can also aid other curriculum designers in their efforts to construct and analyze task inventory questionnaires.

A suggested outline of a report is as follows:

I. Introduction
   - A. Purpose of the Survey
   - B. Definition of the Occupational Area

II. Methodology
   - A. Construction of the Task Inventory
   - B. Validation of the Task Inventory
   - C. Selection of the Worker Sample
   - D. Data Collection Procedures

III. Description of Specific Jobs Within the Occupational Area

IV. Job Overlap (similarity) and Difference Descriptions

V. Summary and Conclusions

VI. Appendix
   - A. Group Summary
   - B. Background Information
   - C. Revised Task Inventory

Self-Test Items

These items are designed to help the reader evaluate his learning of aspects of the last set of steps. Suggested answers to the questions are given after all questions are stated.

Q.1. Why should a record be maintained on who has been sent and who has returned completed copies of the questionnaire?

Q.2. Why is it necessary for someone to scan each copy of the questionnaire after it is returned?

Q.3. Since write-in tasks provided by incumbents cannot be incorporated immediately in an inventory, why bother to get them?

Q.4. If a questionnaire directed the respondent to employ a rating procedure in which a 1 meant "very little, very easy, very low, etc.," while a 7 meant "very much, very difficult, very high, etc.," check which of the following questions a respondent could easily answer by such a rating procedure.

___1. How difficult is this task to perform?
___2. How important is this task?
___3. How varied should training be for this task?
___4. What proficiency level should be achieved?
___5. How complex is this task to perform?
___6. How concrete should training be for this task?
___7. When should this task be performed without aid?
___8. Is this task critical to satisfactory job performance?
___9. Does performance of this task require technical assistance?
___10. What level performance standards are required?
___11. How much time (days) is required to learn this task?
___12. Who should supervise performance of this task?

A.1. Maintenance of such records will make it easier to detect delays in returns of questionnaires and to initiate follow-up efforts.

A.2. Live scanning must be performed to compile task statements that may have been written in by incumbents and to locate any questionnaires that have not been completed properly in the background section.

A.3. The assumption that such tasks cannot be incorporated immediately in an inventory is not exactly true. They can be included as fast as one is willing to change his inventory. Generally, however, new tasks are stored until the analyst believes that it would be advantageous to make a formal change in his inventory. If the new tasks are valid, then they should be made a part of the inventory as soon as possible. Otherwise, one may obtain information that is neither timely nor comprehensive.

A.4. Some of the questions readily fit the rating procedure and can easily be rated; others can't be rated unless they are changed in wording. Task statements where the following questions are used are probably easy to rate: 1, 2, 4, 5, 10, and 11. The others should be changed—some slightly, some more drastically—to facilitate use of the rating procedure. For example, this rewording of question 3 might make it more suitable: "How much variation in training should there be for this task?" Question 6 is somewhat like number 3, but the term "concrete" is much too vague. To use the procedure, this question needs a major revision. Questions 7 and 12 cannot be answered with the rating procedure. They call for entirely different kinds of responses by the incumbent. Questions 8

and 9 are stated so that the respondent must say "yes" or "no." Therefore, neither one is ideally suited to the rating procedure as it stands. Question 9 could be modified to fit the procedure by inserting the word "much" after the word "require." Comparable changes in question 8 would also make it more suitable.

APPENDIX A
Duty Statements

DUTY STATEMENTS

I. Automotive Mechanics Task Inventory
- A. Organizing and Planning
- B. Supervising
- C. Evaluating and Inspecting
- D. Training
- E. Performing Maintenance Control Functions
- F. Performing – Engine Overhaul Activities
- G. Maintaining and Repairing Power Trains
- H. Maintaining and Repairing Automatic Transmissions
- I. Maintaining and Repairing Electrical Systems
- J. Maintaining and Repairing Fuel Systems
- K. Maintaining and Repairing Cooling Systems
- L. Maintaining and Repairing Standard and Power Steering Units
- M. Maintaining and Repairing Breaking Systems
- N. Maintaining and Repairing Front Ends
- O. Maintaining and Repairing Automobile Air Conditioners
- P. Maintaining and Repairing Automobile Heaters
- Q. Lubricating and Maintaining

II. Business Data Processing Task Inventory
- A. Supervising Data Services Functions
- B. Supervising Management Analysis
- C. Supervising Automatic Data Processing Equipment Operations
- D. Supervising Programming
- E. Supervising Data Systems Analysis and Design
- F. Performing Data Processing Functions
- G. Performing Management Analysis Functions
- H. Operating Automatic Data Processing Equipment
- I. Performing Systems Programming
- J. Performing Scientific Programming
- K. Programming Computers
- L. Performing Feasibility Studies (Pilot Projects)
- M. Designing Data Systems

III. Secretarial Science Task Inventory
- A. Organizing and Planning
- B. Supervising and Implementing
- C. Coordinating and Performing Personal Activities for Employer
- D. Inspecting and Evaluating
- E. Training
- F. Performing Stenographic Activities
- G. Performing Bookkeeping and Accounting Activities
- H. Preparing Forms and Publications
- I. Performing Receptionist Activities
- J. Performing Clerical Activities
- K. Maintaining Files and Library
- L. Performing Mailroom Activities

APPENDIX B
Background Information Questions

BACKGROUND INFORMATION

CHECK YOUR PRESENT JOB TITLE:

Automotive mechanic apprentice	☐	Job specialist	☐
Automotive mechanic	☐	Service manager	☐
Service advisor or writer	☐	Garage owner	☐

OTHER (Specify) _____

CHECK THE TYPE OF BUSINESS IN WHICH YOU PRESENTLY WORK:

New car dealer	☐	Service station	☐
Independent garage	☐	OTHER (Specify)	_____

HOW MANY OF YEARS HAVE YOU WORKED AS AN AUTOMOTIVE MECHANIC?

_____ YEARS

WHERE DID YOU RECEIVE YOUR TRAINING IN AUTOMOTIVE MECHANICS?
(check one or more)

On-the-job (self learned)	☐	Apprenticeship program	☐
Military training school	☐	High school program	☐
Private automotive mechanic school	☐	Post-high school program	☐
Company training programs	☐	Adult education program	☐

BACKGROUND INFORMATION

CHECK YOUR PRESENT JOB TITLE:

MANAGER, DATA PROCESSING	☐	SENIOR PROGRAMMER	☐
MANAGER, COMPUTER OPERATIONS	☐	LEAD PROGRAMMER	☐
MANAGER, EDP	☐	PROGRAMMER	☐
SYSTEMS ENGINEER	☐	PROGRAMMER, JUNIOR	☐
SYSTEMS PROGRAMMERS	☐	COMPUTER CONSOLE OPERATOR	☐
SYSTEMS AND PROCEDURES ANALYSTS	☐	DATA CONVERTING OPERATOR	☐

OTHER (SPECIFY) _____

CHECK THE TYPE OF BUSINESS YOU ARE EMPLOYED IN:

MANUFACTURING	☐	PUBLIC UTILITIES	☐
INSURANCE	☐	RESEARCH + EDUCATION	☐
DISTRUBUTION (WHOLESALE-RETAIL)	☐	GOVERNMENT	☐
BANKING - FINANCE	☐	PUBLISHING	☐
DATA PROCESSING SERVICE BUREAUS	☐	CONSTRUCTION	☐

OTHER (SPECIFY) _____

HOW MANY YEARS HAVE YOU WORKED AT YOUR PRESENT JOB? ____.

HOW MANY YEARS HAVE YOU WORKED IN DATA PROCESSING? ____

WHERE DID YOU RECEIVE YOUR TRAINING IN DATA PROCESSING?
(CHECK ONE OR MORE)

ON-THE-JOB (SELF LEARNED)	☐	PUBLIC SECONDARY SCHOOLS	☐
MILITARY TRAINING SCHOOL	☐	PUBLIC VOCATIONAL-TECHNICAL SCHOOLS	☐
COMPANY IN-PLANT TRAINING PROGRAMS	☐	JUNIOR COLLEGE	☐
EQUIPMENT MANUFACTURERS' TRAINING PROGRAMS	☐	COLLEGE OR UNIVERSITY	☐
CORRESPONDENCE COURSES	☐	PRIVATE BUSINESS SCHOOL	☐

OTHER (SPECIFY) _____

BACKGROUND INFORMATION

CHECK YOUR PRESENT JOB TITLE:

RECEPTIONIST ☐	GENERAL SECRETARY ☐	OFFICE MANAGER ☐
TYPIST ☐	LEGAL SECRETARY ☐	EXECUTIVE SECRETARY ☐
STENOGRAPHER ☐	MEDICAL SECRETARY ☐	ADMINISTRATIVE ASSISTANT ☐

OTHER (SPECIFY) _____

CHECK THE TYPE OF BUSINESS IN WHICH YOU ARE EMPLOYED:

BANKING-FINANCE ☐	INSURANCE ☐	LEGAL SERVICE ☐
CONSTRUCTION ☐	MANUFACTURING ☐	HEALTH SERVICE ☐
DISTRIBUTION (WHOLESALE-RETAIL) ☐	PUBLIC UTILITIES ☐	TRANSPORTATION ☐
EDUCATIONAL+RESEARCH ☐	PUBLISHING ☐	GOVERNMENTAL

OTHER (SPECIFY)_____ LOCAL ☐ STATE ☐ FEDERAL ☐

____ HOW MANY YEARS HAVE YOU WORKED AT YOUR PRESENT JOB?

____ HOW MANY YEARS HAVE YOU WORKED IN THE SECRETARIAL FIELD?

____ FOR HOW MANY PERSONS DO YOU PERFORM YOUR SECRETARIAL DUTIES?

____ WITH HOW MANY OTHER SECRETARIES DO YOU WORK IN PERFORMING YOUR DUTIES?

WHERE DID YOU RECEIVE YOUR TRAINING IN THE SECRETARIAL FIELD?

ON THE JOB (SELF LEARNED) ☐	PUBLIC VOCATIONAL-TECHNICAL SCHOOL ☐
MILITARY SCHOOL ☐	PRIVATE BUSINESS SCHOOL ☐
CORRESPONDENCE COURSES ☐	JUNIOR COLLEGE ☐
PUBLIC SECONDARY SCHOOL ☐	COLLEGE OR UNIVERSITY ☐

OTHER (SPECIFY) _____

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APPENDIX C
Instructions For Completing Task Inventories

INSTRUCTIONS FOR COMPLETING TASK INVENTORY

CAREFULLY READ EACH OF THE TASK STATEMENTS AND PLACE A CHECK MARK (✓) IN THE COLUMN LABELED CHECK FOR EACH TASK WHICH YOU PERFORM ON YOUR PRESENT JOB.

AFTER CHECKING ALL TASKS WHICH YOU PERFORM, THEN RATE ONLY THE TASK YOU HAVE CHECKED BY PLACING A NUMBER 1, 2, 3, 4, 5, 6, OR 7, IN THE COLUMN LABELED TIME SPENT WHICH MOST CLOSELY ESTIMATES THE AMOUNT OF TIME YOU SPEND IN PERFORMING THE TASK.

TIME SPENT MEANS THE TOTAL TIME YOU SPEND ON EACH TASK YOU ARE RATING, COMPARED WITH THE TIME YOU SPEND ON EACH OF THE OTHER TASKS YOU DO.

AT THE BOTTOM ON ANY PAGE, WRITE IN AND RATE ANY TASKS YOU DO WHICH ARE NOT LISTED.

EXAMPLE:

AUTOMOTIVE MECHANICS TASK INVENTORY	Page 19 of 23 Pages	
LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.	CHECK	TIME SPENT 1. Very Much Below Average 2. Below Average 3. Slightly Below Average 4. About Average 5. Slightly Above Average 6. Above Average 7. Very Much Above Average
M. MAINTAINING AND REPAIRING BRAKING SYSTEMS	✓ if Done	
1. Repair master cylinder		
2. Repair wheel cylinder	✓	4
3. Replace brake hoses and lines	✓	1
4. Replace brake shoes	✓	6
5. Resurface brake drums		
6. Adjust brakes	✓	7

INSTRUCTIONS FOR COMPLETING TASK INVENTORY

CAREFULLY READ EACH OF THE TASK STATEMENTS AND PLACE A CHECK MARK (✓) IN THE COLUMN LABELED CHECK FOR EACH TASK WHICH YOU PERFORM ON YOUR PRESENT JOB.

AFTER CHECKING ALL TASKS WHICH YOU PERFORM, THEN RATE ONLY THE TASK YOU HAVE CHECKED BY PLACING A NUMBER 1, 2, 3, 4, 5, 6, OR 7 IN THE COLUMN LABELED TIME SPENT WHICH MOST CLOSELY ESTIMATES THE AMOUNT OF TIME YOU SPEND IN PERFORMING THE TASK.

TIME SPENT MEANS THE TOTAL TIME YOU SPEND ON EACH TASK YOU ARE RATING, COMPARED WITH THE TIME YOU SPEND ON EACH OF THE OTHER TASKS YOU DO.

AT THE BOTTOM ON ANY PAGE, WRITE IN AND RATE ANY TASKS YOU DO WHICH ARE NOT LISTED.

EXAMPLE:

DATA PROCESSING TASK INVENTORY	Page _____ of _____ Pages	
LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.	CHECK ✓ If Done	TIME SPENT 1. Very Much Below Average 2. Below Average 3. Slightly Below Average 4. About Average 5. Slightly Above Average 6. Above Average 7. Very Much Above Average
K. PROGRAMMING COMPUTERS		
1. Adapt programs written in symbolic language to different computer configurations	✓	4
2. Analyze applications to select appropriate utility programs and subroutines	✓	2
3. Analyze computer inputs prior to test run and follow-up	✓	1
4. Analyze programming documentation		
5. Audit computer inputs after test run and follow-up	✓	6
6. Code computer applications using a reports program generator		
7. Code programs utilizing more than one language	✓	7

INSTRUCTIONS FOR COMPLETING TASK INVENTORY

CAREFULLY READ EACH OF THE TASK STATEMENTS AND PLACE A CHECK MARK ( ) IN THE COLUMN LABELED CHECK FOR EACH TASK WHICH YOU PERFORM ON YOUR PRESENT JOB.

AFTER CHECKING ALL TASKS WHICH YOU PERFORM, THEN RATE ONLY THE TASK YOU HAVE CHECKED BY PLACING A NUMBER 1, 2, 3, 4, 5, 6, OR 7 IN THE COLUMN LABELED TIME SPENT WHICH MOST CLOSELY ESTIMATES THE AMOUNT OF TIME YOU SPEND IN PERFORMING THE TASK.

TIME SPENT MEANS THE TOTAL TIME YOU SPEND ON EACH TASK YOU ARE RATING, COMPARED WITH THE TIME YOU SPEND ON EACH OF THE OTHER TASKS YOU DO.

AT THE BOTTOM ON ANY PAGE, WRITE IN AND RATE ANY TASKS YOU DO WHICH ARE NOT LISTED.

EXAMPLE:

SECRETARIAL SCIENCE TASK INVENTORY	Page ____ of ____ Pages	
LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.	CHECK	TIME SPENT 1. Very Much Below Average 2. Below Average 3. Slightly Below Average 4. About Average 5. Slightly Above Average 6. Above Average 7. Very Much Above Average
F. PERFORMING STENOGRAPHIC ACTIVITIES	✓ If Done	
1. Compose correspondence	✓	6
2. Edit letters dictated by employer	✓	4
3. Operate dictaphone	✓	1
4. Operate dictating machine		
5. Operate shorthand machine	✓	7
6. Transcribe (type) from dictaphone	✓	2
7. Type minutes of reports of meetings	✓	5

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APPENDIX D
Samples Of Introductory Letters

INDEPENDENT GARAGE OWNERS OF OHIO, Inc.

8 East Long Street - Room 422 Telephone: (614) 221-4094

COLUMBUS, OHIO 43215

OHIO MEMBER IGO SERVICES CHAPTER

Dear Mr.

We need your help! The Independent Garage Owners Associatio of Ohio and The Center for Vocational and Technical Education at The Ohio State University are cooperating to assemble a complete list of tasks that are performed by automotive mechanics. Because you have been identified as an outstanding mechanic, we need your advice in assembling this information which will aid you and your profession in the following ways:

1. Specific jobs and paths for advancement can be better defined within the automotive mechanics field

2. To provide information for a mechanic certification program

3. Better training programs can be developed in which both the new mechanic and the master mechanic can take part.

What we are asking for is a little of your time and the results of your experience on the job; to review the enclosed task list for automotive mechanics. Only you can tell us whether these lists are complete and valid.

Please fill out the brief informational page and follow the directions for checking and rating the tasks on the list. We have enclosed an Ohio State pen and a stamped envelope for returning the completed inventory. The pen is yours to keep as a token of our appreciation for your help.

Only you can make this research go and only you can help to raise your profession to the level to which it rightly belongs.

Sincerely,

Independent Garage
Owners Association

Sincerely,

The Ohio State University
Research Specialist

SB/ds

Enclosures

P.S. We have also enclosed a 1971-1972 Ohio State football schedule.

The Center For RESEARCH AND LEADERSHIP DEVELOPMENT IN

Vocational and Technical Education

THE OHIO STATE UNIVERSITY
1900 KENNY ROAD
COLUMBUS, OHIO 43210

Dear Sir:

We need your help! The Ohio Automobile Dealers Association and The Center for Vocational and Technical Education at The Ohio State University are cooperating to assemble a complete list of tasks that are performed by automotive mechanics. Because you have been identified as an outstanding mechanic, we need your advice in assembling this information which will aid you and your profession in the following ways:

1. Specific jobs and paths for advancement can be better defined within the automotive mechanics field

2. To provide information for a mechanic certification program

3. Better training programs can be developed in which both the new mechanic and the master mechanic can take part.

What we are asking for is a little of your time and the results of your experience on the job; to review the enclosed task list for automotive mechanics. Only you can tell us whether these lists are complete and valid.

Please fill out the brief informational page and follow the directions for checking and rating the tasks on the list. We have enclosed an Ohio State pen and a stamped envelope for returning the completed inventory. The pen is yours to keep as a token of our appreciation for your help.

Only you can make this research go and only you can help to raise your profession to the level to which it rightly belongs.

Sincerely,

The Ohio Automobile Dealers Association

The Ohio State University Research Specialist

SB/ds
Enclosures

P.S. We have also enclosed a 1971-1972 Ohio State football schedule.

The Center For RESEARCH AND LEADERSHIP DEVELOPMENT IN

Vocational and Technical Education

THE OHIO STATE UNIVERSITY
1900 KENNY ROAD
COLUMBUS, OHIO 43210

Dear Data Processor:

We need your help! We are conducting a study that we believe you will find interesting and helpful to your profession. We are attempting to assemble and validate a complete list of jobs and tasks performed by data processors.

We will use this information to revise existing data processing curricula in order to improve the quality of training programs being offered for persons in data processing.

What we are asking for is a little of your time, and the results of your experience on the job; to review the enclosed task inventory for data processing. Only you can tell us whether these lists are complete and accurate.

Please fill out the brief informational page and follow the directions for checking and rating the tasks on the list. We have enclosed an Ohio State pen and a stamped envelope for completing and returning the inventory. The pen is yours to keep as a token of our appreciation for your help.

We are depending on you to provide us with the necessary information for improving data processing programs. Please complete and return the inventory TODAY!

Sincerely,

Research Specialist

SB/ds

Enclosures

The Center For RESEARCH AND LEADERSHIP DEVELOPMENT IN

Vocational and Technical Education

THE OHIO STATE UNIVERSITY
1900 KENNY ROAD
COLUMBUS, OHIO 43210

Dear NSA Member:

We need your help! We are conducting a study that we believe you will find interesting and helpful to your profession. We are attempting to assemble and validate a complete list of jobs and tasks performed by professional secretaries.

We will use this information to revise existing secretarial curricula in order to improve the quality of training programs being offered for persons in secretarial occupations.

What we are asking for is a little of your time, and the results of your experience on the job; to review the enclosed task inventory for secretarial science. Only you can tell us whether these lists are complete and accurate.

Please fill out the brief background information page and follow the directions for checking and rating the tasks on the list. We have enclosed an Ohio State pen and a stamped envelope for completing and returning the inventory. The pen is yours to keep as a token of our appreciation for your help.

We are depending on you to provide us with the necessary information for improving secretarial training programs. Please complete and return the inventory TODAY!

Sincerely,

Research Specialist

SB/ds

Enclosures

The National Secretaries Association
(International)

(1-05-200)
Columbus Chapter
Columbus, Ohio

May 3, 1971

All Members
Columbus Chapter, NSA
Columbus, OH

Dear NSA Members:

We are apparently accomplishing many of our goals and objectives. The educators are requesting our assistance in educational curriculum for secretarial occupations.

The Columbus Chapter Executive Board urges your immediate attention to the enclosed letter and the unquestionably thorough survey. We realize this will take some of your valuable time, but think what it could mean for our profession when beginning on-the-job secretarial education while still in school.

Please complete your questionnaire as quickly as possible and return in the enclosed self-addressed envelope. The results of this project will be made available to us at a later date. Please do not let all the hours of study and concern behind this project go to waste. Without nearly 100% participation on our part, a completely true analysis cannot be made. Complete and return yours today!

Sincerely yours,

President
The National Secretaries Association

CERTIFIED PROFESSIONAL SECRETARY

APPENDIX E
Task Inventory Format

DATA PROCESSING TASK INVENTORY

LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.

N. PERFORMING DATA SYSTEMS ANALYSIS	CHECK (√ If Done)	TIME SPENT (1. Very Much Below Average; 2. Below Average; 3. Slightly Below Average; 4. About Average; 5. Slightly Above Average; 6. Above Average; 7. Very Much Above Average)	
1. Define objectives of system studies			8:13
2. Develop directives pertaining to data systems			14
3. Develop networks such as PERT, CPM, and LESS			15
4. Evaluate data for duplications and unnecessary requirements			16
5. Evaluate data for relationship of output to source documents			17
6. Evaluate file contents and sequences			18
7. Evaluate problem areas adaptable to modifications			19
8. Evaluate utilization of output products			20
9. Identify data interface requirements			21
10. Identify problem areas in the system			22
11. Identify source documents, internal files and final reports			23
12. Perform initial analysis of requests for systems studies			24
13. Prepare decision charts			25
14. Prepare presentations on data systems operations			26
15. Prepare grid and matrix charts of input, or output files			27
16. Provide systems consultative services to potential customers			28
17. Schedule systems studies			29
18. Update and review schedules and program networks			30

APPENDIX F
Samples Of Follow-Up Instruments

JUST A REMINDER

We are depending on you to complete and return the "Automotive Mechanics Task Inventory" sent to you last week. Would you please take a few minutes to complete and return it to us today.

Thanks for your cooperation,

Independent Garage Owners Association of Ohio, Inc.
and
The Ohio State University

THANK YOU!!!!!!!

for taking the time to complete and return

the Automotive Mechanics Task Inventory.

We appreciate *YOUR* help!!!!!!!

Sincerely,

Independent Garage
Owners Association

Sincerely,

The Ohio State University
Research Specialist

SB/ds

INDEPENDENT GARAGE OWNERS OF OHIO, Inc.

8 East Long Street - Room 422 Telephone: (614) 221-4094
COLUMBUS, OHIO 43215

OHIO MEMBER IGO CHAPTER

Dear Mr.

We still have not received the completed Automotive Mechanics Task Inventory from you. YOUR response is VITAL! Only YOU can provide us with this information.

In the event that you have misplaced your inventory booklet, we have included another copy for you to complete and return to us in the enclosed envelope.

Please complete the inventory and return it to us TODAY!

Sincerely, Sincerely,

Independent Garage Owners Association

The Ohio State University Research Specialist

SB/mml
Enclosures

Task Inventory Questionnaire Record

Area: Automotive Mechanics

Form	Sent or delivered to:	No. of Copies	Date	Date Returned	No. Copies Received	Follow-up Action
1972-A	Hal Burton Burton's Garage 117 East 7th Columbus, OH	3 (#1-3)	11Dec72	11Jan73	3	phone 8 Jan 73
1972-A	Ronald Smith, Mgr. Danby-Mills Ford Lawton, OK	15 (#4-18)	12Dec72	19Dec72 15Jan73	8 3	ltr 11 Jan 73
1972-A	George M. Rankin, Pres. Modern Chevrolet, Inc. 1918 West 42nd St. Indianapolis, IN	12 (#19-30)	18Dec72			
1972-A	Saul Ritterhouse Saul's Automotive 2112 Darby Rd. Cleveland, OH	5 (#31-35)	18Dec72			